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U.S. exports of feedgrains soared from 11.1 million tons in 1960 to 24.3 million in 1966, then declined to 16 million in fiscal 1969. For a wrap-up of world trade in feedgrains during the past decade see article beginning this page.

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The Story of the 1960's

By LARRY F. THOMASSON
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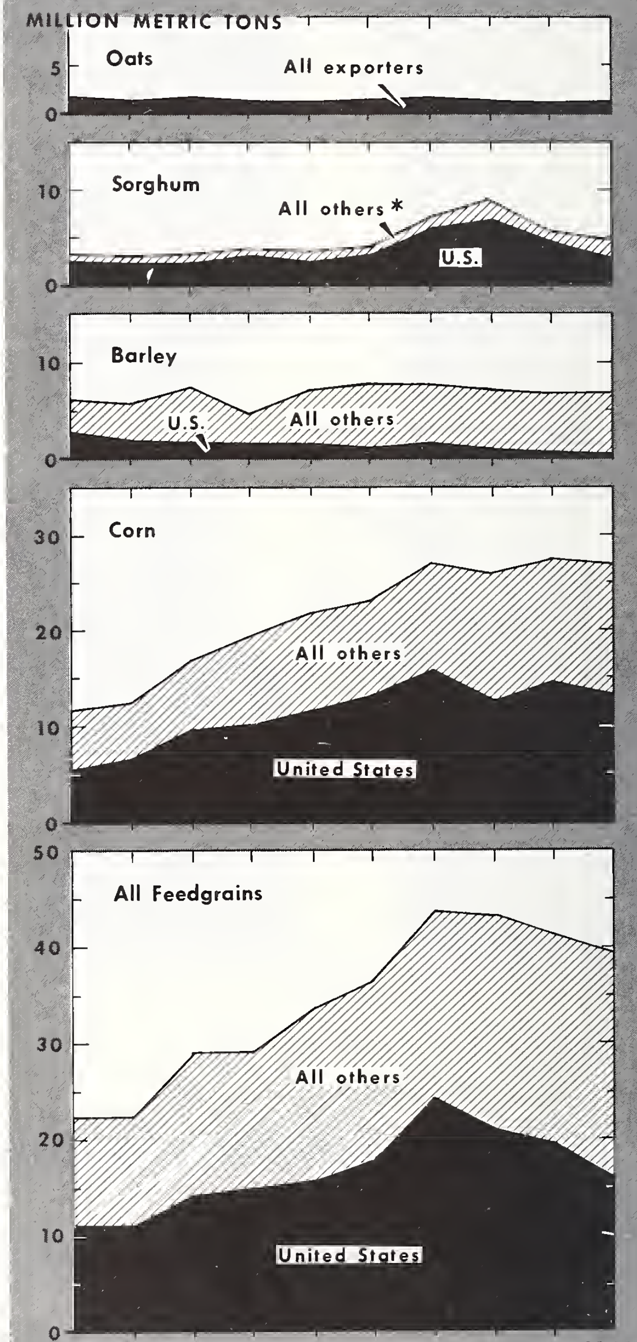
TRENDS IN U.S. AND WORLD EXPORTS OF MAJOR FEEDGRAINS



* Principal exporters —Argentina, South Africa, Australia, Thailand.
△ Preliminary. Fiscal year ending June 30.

U.S. Feedgrains in World Trade

The producers and exporters of feedgrains in our country occupied center stage during most of the decade of the 1960's in what will undoubtedly be recorded as one of the most impressive growth performances ever for world trade in a major commodity group.

In the first 7 fiscal years of the decade, 1960 through 1966, world exports of feedgrains (corn, sorghum,[1] barley, and oats excluding products) almost doubled, rising from 22.3 million metric tons, valued at about $1.2 billion, to 43.8 million tons worth nearly $2.4 billion. And U.S. exports soared from 11.1 million tons to 24.3 million—an expansion of 13.2 million tons, which added about $720 million to our balance of trade and moved feedgrains into the "billion dollar export" class.

The last 3 years of the decade, however, tell a different story for feedgrain exports on both the world and the U.S. level. World feedgrain exports have declined about 10 percent from the 1966 peak of 43.8 million tons to an estimated 39.4 million in the fiscal year just ended—1969. Meanwhile, however, U.S. exports have dropped from 24.3 million tons to 16 million.

As we cast around for possible explanations of the course of U.S. and world feedgrain trade during the 1960's—rapid growth, temporary plateau, and current decline—two major reasons come to mind immediately. First, competition among exporters has grown rapidly and in some unexpected quarters. Second, most major markets have shrunk, particularly since 1966. In both these changes, the European Community is predominant: it is still a major market, but it has now become a major competitor. Its Common Agricultural Policy (CAP) has reversed its feedgrain trade trend, so that this former top customer for third-country exports is now supplying feedgrains to a number of third-country markets as well as meeting more of its own needs.

Even though 1966 was well above trend for both world and U.S. feedgrain exports, the slump of the last 3 years points up clearly the problems of policy, marketing, and competition that must be overcome if the historical U.S. share of the market is to be maintained or possibly expanded—with all that it means in employment and income for the thousands of persons involved, from the planting of the seed to the sailing of the ship.

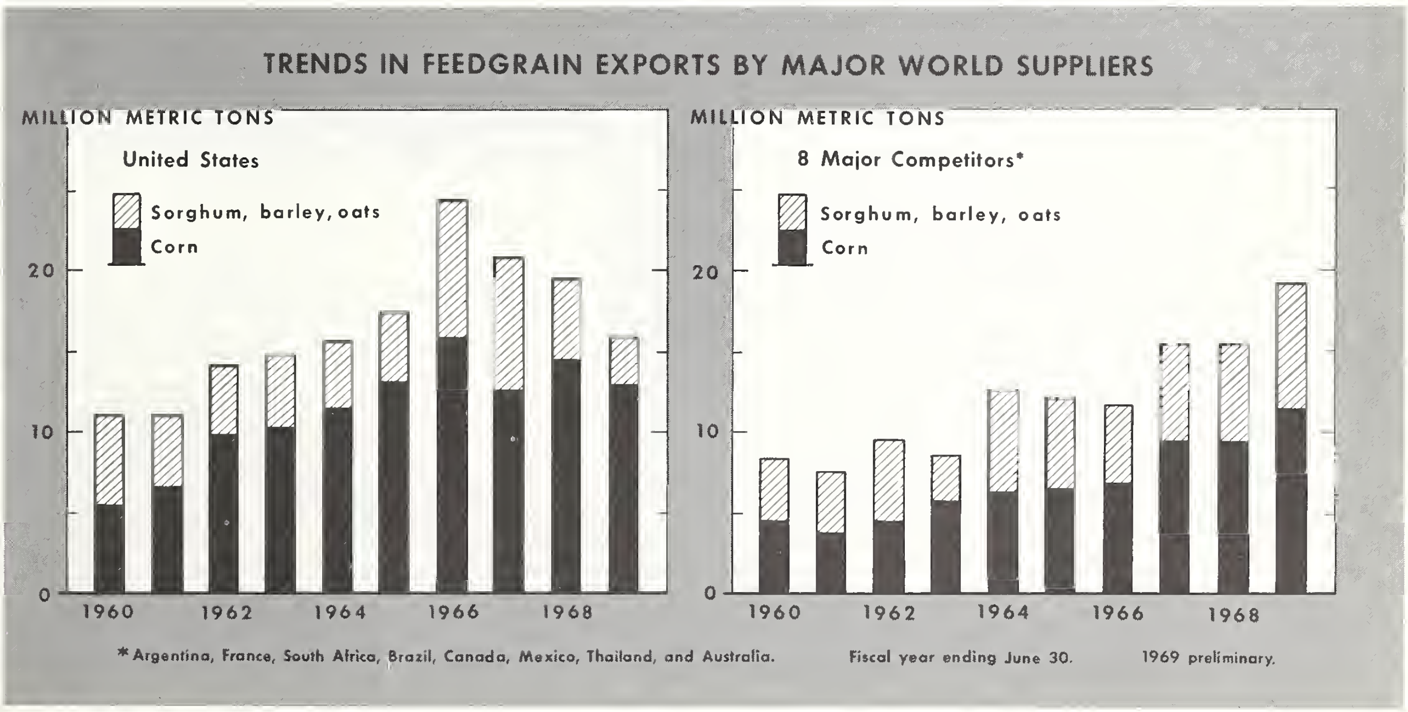
Competition grew rapidly

The United States and just eight other countries—Argentina, France, South Africa, Brazil, Canada, Mexico, Thailand, and Australia—accounted for 80 to 88 percent of world feedgrain exports during the decade.

The *United States* started the period with a 50-percent market share in 1960, jumped to just over 55 percent in 1966, fell back to about 40 percent the following 2 years, and then dropped to a low of only 40 percent as the decade ended. The other eight major exporters started at just over 36 percent, dropped to 27 percent in 1966, moved back to around 36 and 37 percent in the subsequent 2 years, and soared to a record 48-percent share in 1969.

Although treated as a group above, the other eight principal exporters followed many divergent paths during the decade. For example, the feedgrain exports of *Canada* and *Australia* (mainly barley) trended downwards during most

[1] Sorghum data include only the five principal exporters—the United States, Argentina, South Africa, Australia, and Thailand—which together accounted for over 90 percent of sorghum exports during each year of the decade.



of the period, having a combined total of 1.2 million tons in 1969 versus 2.2 million in 1960. Only one year was lower —1963 at 1.15 million—while none were higher.

The overall trend in the remaining six countries was up during the decade, ranging from fairly steady growth in Thailand, France, and Argentina to a much more erratic pattern in South Africa, Mexico, and Brazil.

Argentine exports (mainly corn and sorghum) went from 4 million tons in 1960 to 5.6 million in 1969, reaching respective low and high levels of 2.5 million and 6.5 million during the decade. *French* exports (mainly barley and corn), which started at only 500,000 tons in 1960, were skyrocketed to nearly 6 million in 1969, also representing the low- and high-water marks. Much of this increase was in exports to member EC countries, which will be treated in some depth in a later section. Any exports to third countries require large subsidies because of the high domestic support prices in the Community.

Thailand is the only country of the group that has enjoyed almost uninterrupted growth in exports (mostly corn), from 300,000 tons in 1960 to 1.3 million in 1969. The main reasons for this success are believed to be an agricultural policy that has favored corn production (usually over 80 percent of domestic production is exported) and successive export contractual arrangements with Japan. Under these agreements Japan has contracted in advance for a major portion of Thailand's export availabilities at favorable prices in relation to estimated production costs. Any major expansion of domestic livestock production to provide an improved diet for the Thai people would, of course, modify the present situation somewhat.

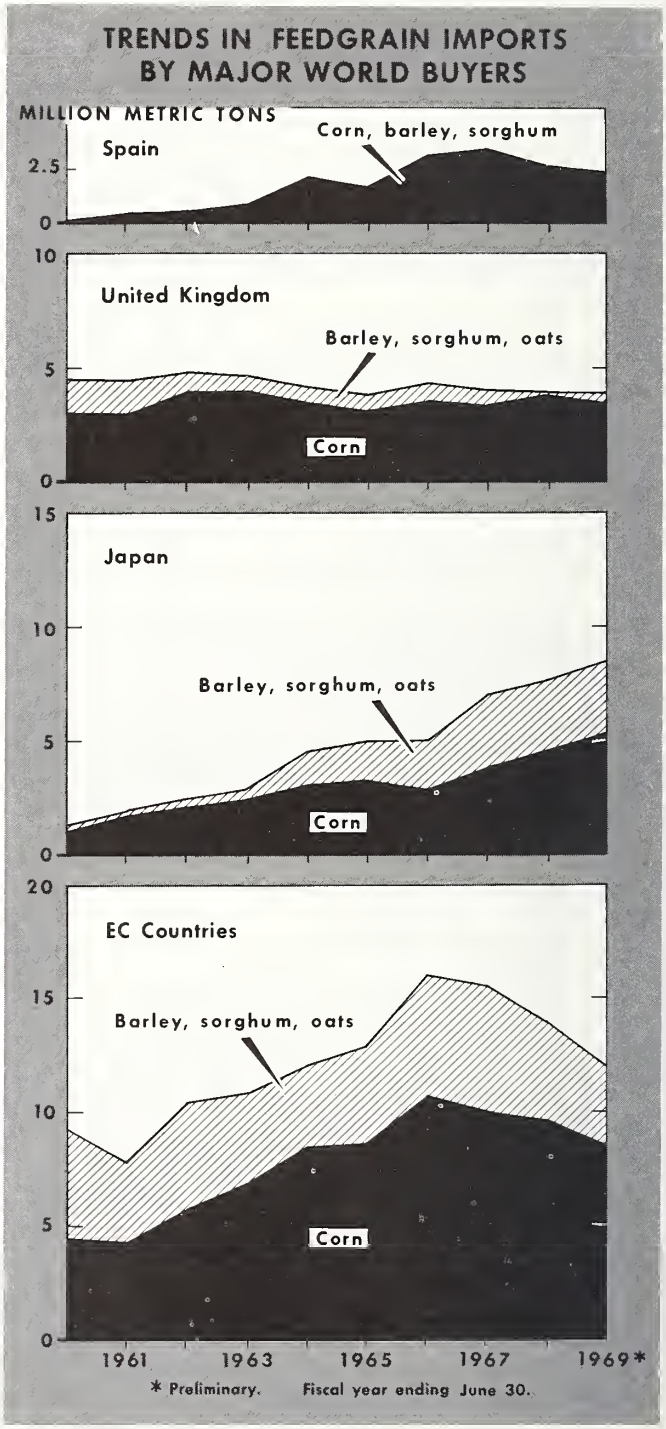
Wide swings by some competitors

Exports from *South Africa* (mainly corn) are subject to wider fluctuations than those of the other major exporters, owing primarily to the marginal climatic conditions in the main zones of production. Hence, the 1960 and 1969 totals of 700,000 and 2.8 million tons and the low-high totals of 600,000 and 3.1 million are not surprising. These fluctuations are even more the expected norm rather than the exception when one remembers that South Africa has limited facilities for holding stocks from one year to the next. Also, domestic prices are already above the world market level, and storage expenses would only add to the costs of present export subsidization.

Mexico is another principal exporter whose support prices exceed the international price levels. Exports (mainly corn) were 400,000 in 1960 and almost 1 million tons in 1969. The respective low-high levels during the sixties were 0 and 1.3 million tons. However, exports averaged just over 1 million tons per year during the last half of the decade as compared with about 100,000 during the first half. This indicates a strengthening of the export position as the decade progressed. But the current year's outlook is clouded by a poor harvest, and Mexico is importing corn.

The final country in the group, *Brazil*, started the decade with almost no exports and reached a high of nearly 1.2 million tons (all corn) in 1969. Average exports in the first 5 years were 160,000 tons versus 600,000 during the last 5 years. The future is believed to be primarily dependent upon the balance maintained among domestic production and consumption policies and export policy. From about mid-1968 until very recently, tax policies favored exports, and the result was increased exports and a more rapid inflation of domestic prices. A policy that would permit the Brazilian consumer to enjoy more of the benefits of low-cost corn production, especially increased meat consumption, could drastically alter Brazilian corn export possibilities.

Exports by all other exporters (excluding the United States and the eight countries just mentioned) increased from 3.2 million tons in 1960 to 4.6 million in 1969. The lowest year was 1960. The high was 7.8 million in 1966, almost 18 percent of that year's total world exports. All these exporters combined ranged from a market share of almost one-fifth



in 1963 and 1965 to only 12 percent as the decade ended.

This group, however, includes exports by the Bloc countries, which are also sizable feedgrain importers. So exports alone give an inflated picture of their importance as exporters. Combined exports of feedgrains by the East European countries and the USSR averaged just over 3 million tons during 1961-65 versus over 2.5 million in imports. Thus, net exports averaged about 500,000. Data available for subsequent years show that net trade has varied from about 200,000 tons on the import side in 1966 to over 1 million in exports in 1967. The limited information available for 1969 indicates a net export position of perhaps 1 million.

1966, peak export year

There are, of course, disadvantages as well as advantages in being the dominant feedgrain supplier. But for the United States, as the world's major source of supplies, fiscal 1966 was clearly the year in which the advantages prevailed. In that year, the combined needs of importers leaped by 7 million tons, or about one-fifth, above those of the previous year.

The EC countries alone accounted for nearly 3.3 million tons (48 percent) of the increased needs, mainly because of reduced grain harvests and inadequate supplies. Spain registered the next largest increase, slightly over 1.5 million tons, brought about by a combination of reduced production and expanded requirements. The U.K. increase of 400,000 tons was not out of the ordinary. And Japan's imports hardly expanded at all—only 50,000 versus an average increase of about 800,000 per year throughout the decade. In combination, therefore, these principal importers accounted for 5.2 million or three-fourths of the huge export growth recorded for fiscal 1966.

This leaves about 1.8 million tons unaccounted for, of which about 1 million went to India.

This was the year when the United States and much of the world had serious preoccupations regarding the adequacy of food supplies. World wheat supplies were much reduced from previous levels. India's grain production dropped catastrophically from severe drought, and its import needs reached record proportions. Fortunately, many Indians were accustomed to eating milo and U.S. sorghums were an acceptable substitute during this emergency.

The United States, principal supplier of food aid to India, covered most of this unusual increase in import needs. However, the reason for our also supplying the bulk of the expanded commercial market requirements of the EC and Spain was quite different. Primarily, it was the availability of supplies from U.S. reserve stocks.

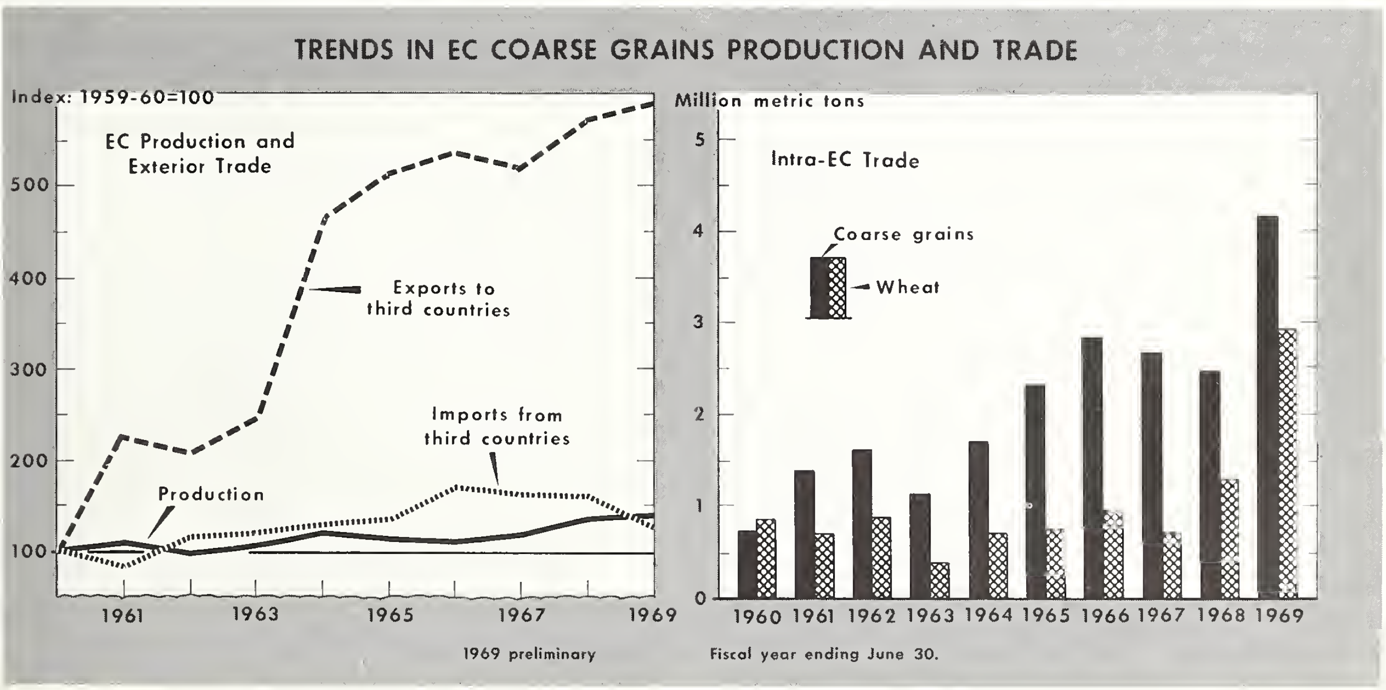
Argentine and Australian exports declined by 1.6 million tons in 1966, owing to the near exhaustion of supplies, while South African, French, and Canadian exports declined about 100,000. Brazil, Mexico, and Thailand combined exported an additional 1.3 million tons, and all other exporters, 500,000 more. The net result for all exporters except the United States was an increase of about 100,000 tons in exports.

Thus the United States was able to supply an additional 6.9 million tons of feedgrains for which a fairly urgent need developed in fiscal 1966, against a total increased world import need of 7 million. The odds against this particular combination of circumstances happening again in so brief a time span are probably long. However, it did happen this once, and our country was fortunate in that it could assist.

Major markets shrank after 1966

The story of what has happened in the major import markets—the EC, Japan, the United Kingdom, and Spain—provides the basic reasons for the export behavior already described, both its rise before 1966 and its decline thereafter.

Details regarding the EC countries will be treated separately. As a group, these countries have been the largest feedgrain market in the world on a gross and net import basis for many years. However, with intra-EC trade excluded, the EC's net coarse grain imports in 1969 were exceeded by those of *Japan*. Lacking sufficient land to increase its



own feedgrain production, Japan expanded its imports rapidly during the decade, from 1.2 million tons in 1960 to 8.5 million in 1969, or about 800,000 tons a year on the average. The United States has been and remains its dominant supplier.

However, it is well known that Japan is seeking to develop additional sources of supply, especially where this may also facilitate its exports. The story of Thailand's corn exports to Japan is a dramatic example of the success of the Japanese policy. Somewhat similar efforts are being encouraged by the Japanese in such places as Indonesia, Cambodia, Australia, and Laos.

The next largest feedgrain market, although a static or declining one during the sixties, is the *United Kingdom*. Its imports—practically all of corn—were 4.6 million tons in 1960 but 4 million in 1969, with a low-high spread of 3.9 million to 4.8 million during the decade. The United States has been the major supplier.

The United Kingdom has successfully followed policies that stimulated domestic grain production, especially of barley, to meet its growing feedgrain requirements. It has even exported barley in sizable quantities during several years.

Next to the United Kingdom as a market comes *Spain*, with imports of 2.2 million tons in 1969 representing a dramatic growth from only 155,000 in 1960. Here also, imports are declining as the decade ends, owing to the Spanish agricultural policy that raised grain support prices and stimulated home production to meet expanding needs. But the policy resulted in excess wheat production, which then necessitated large subsidies for disposal in export markets. Even this has not eliminated the problem entirely, complicated as it was by the generally low milling quality of Spanish wheat and by huge world supplies. These problems gave impetus to current policies aimed at switching enough wheat land to feedgrains to both achieve a balance in wheat production and further reduce feedgrain imports.

The U.S. share of the Spanish market, which was generally over 50 percent, dropped drastically to less than 10 percent during the latest fiscal year. This drop was mainly the result of inroads made into this market by French, Brazilian, and Argentine corn.

As the decade ended, imports into all other markets, at 12.9 million tons, were only slightly less than one-third of world exports—nearly the same share as in 1960, when they imported 7.1 million tons. Their share of the world market varied between 31 and 38 percent during the decade. In 1969, no single one of them imported more than a million tons; those importing more than 500,000 included Canada (corn), Switzerland, Poland, East Germany, and Czechoslovakia.

Effect of CAP on EC feedgrain trade

The 5-year phase-in period for achieving a Common Agricultural Policy (CAP) in the EC was completed in July 1967. The success of this policy appears to have reversed the rising trend in net EC feedgrain imports, though the price has been high. A number of factors have contributed. First, the production index for coarse grains in the EC (1959 crop = 100) reached 136 in 1967 and held at 137 in 1968 and again in 1969. The achievement of this level of production for 3 consecutive years appears to leave little doubt that it can be maintained, assuming that current levels of import protection and high domestic support prices are continued.

Second, and of equal or greater significance for the United States and other grain exporters, was the cresting of the index (1960=100) for EC feedgrain imports from non-EC suppliers at 169 in fiscal 1966 and the subsequent drop to 124 in 1969. Meanwhile, feedgrain exports by the EC to non-EC countries increased nearly sixfold to an index of 587 in fiscal 1969.

A third element of this story was an increase in intra-EC feedgrain trade roughly comparable with that in exports to third countries: each increased from about 700,000 tons in fiscal 1960 to about 4 million in 1969. Thus net EC feedgrain imports from non-EC suppliers amounted to around 8 million tons in 1969, as against 9 million in 1960.

Factors that undoubtedly contributed in large measure to this decline in net EC feedgrain imports were the increased use of wheat for feed in the Community—especially during the past 2 years—and a sharp rise in the use of other feed ingredients.

Intra-EC trade in all wheat in fiscal 1968, at 1.3 million tons, was about double the average of the previous 8 years. Then, in 1969, this figure more than doubled again, to an estimated 2.9 million tons. Much of this increase in intra-EC wheat trade was probably feed wheat, although imports of French wheat by other EC countries could have gone largely into milling and permitted more of their wheat to be used for feed. In total, it is estimated that EC consumption of feed wheat may have reached 8 million tons in 1969, out of total wheat production of over 32 million.

Data regarding the increased use of other feedstuffs, such as alfalfa meal, corn byproducts, high-protein meals, cassava chips, and beet pulp, are incomplete; but there is evidence that they have become a major factor.

Corn was king of the sixties

While exports of other feedgrains (barley, sorghum, and oats) were cruising between continents during the decade, *corn* was going into orbit. From a base of 11.7 million tons in fiscal 1960, world corn exports—led by U.S. corn—moved up rapidly at an average rate of nearly 2.6 million tons a year to 27.3 million in 1966. They plateaued at about this level for the remaining 4 years of the decade, peaking at 27.7 million in 1968 and edging down to 27 million in 1969. Even so, corn's share of total feedgrain exports increased from 52 percent in 1960 to 68 percent in 1969; and it never provided less than 60 percent of the greatly expanded feedgrain trade from 1963 through 1969.

During the decade, U.S. corn exports increased from about 5.5 million tons, or 47 percent of world corn exports, in 1960, to a high of 16 million, or nearly 59 percent of world exports, in 1966. From 1966 through 1969, however, they declined by 3 million tons, accounting for only 48 percent of world exports as the decade ended. The simple average share for U.S. corn was nearly 53 percent for the decade.

Competing exporters have moved out ahead since 1966 as world corn trade has held at about 27 million tons. Meanwhile, all feedgrain exports have dropped by 4 million tons; so corn has obviously solidified its reign. The United States remains the major supplier, but its grip on the lead slipped somewhat in the late sixties and is in need of repair.

Sorghum was the only other major feedgrain showing a

substantial quantitative gain in exports during most of the decade. From nearly 3.1 million tons in 1960, world exports moved to a high of 9 million in 1967. But during the last 2 years of the decade, they plummeted to 5.6 million and then 4.6 million tons. Their market share of all feedgrain exports was 14 percent in 1960 and 21 percent in 1967, but a little under 12 percent in 1969.

The fortunes and misfortunes of sorghum exports are mainly attributable to their ups and downs in one country, our own. In the first 9 years of the decade, the U.S. share of the world total averaged nearly 78 percent, with a high of 85 percent in 1966 and a low of 59 percent in 1969.

Three main factors accounted for most of the fluctuation in U.S. sorghum exports during the late sixties. First was the unusual programing of large quantities of sorghum to India under P.L. 480 after the severe droughts of 1965 and 1966. Wheat supplies were short and sorghums, fortunately, were well accepted. This, however, was not the normal development of a continued market. The emergency ended, and concessional exports of U.S. sorghum to India dropped from 2.2 million tons in 1967 to 126,000 last year.

The second key influence was the EC move to a Common Agricultural Policy between 1962 and 1967. This had the effect of narrowing the corn-sorghum price spread to EC end-users from 6-8 percent in favor of sorghums before the CAP to only about 5 percent when the CAP was achieved.

Then a third disturbing factor surfaced. The normal U.S. corn-sorghum export price spread narrowed, and sorghum prices at the Gulf even moved above those of corn during several months of 1968 and 1969. This has been explained largely by increased domestic demand due to the rapid expansion of beef production in the high plains area of Texas and the adjoining States. But whatever the reasons, U.S. sorghum exports to the EC dropped from nearly 2 million tons in 1966 to only 206,000 in 1969. And exports to Japan, the only other major commercial customer, decreased from 2.4 million tons in 1967 to 1.7 million in 1968.

Meanwhile, combined exports by the major competitors, principally Argentina, increased from no more than 1.1 million tons a year prior to 1967 to 1.8 million, 1.2 million, and 1.9 million tons, respectively, during the last 3 years of the decade. Most of these increased sales were to Japan, and in 1969 this boosted their combined world market share to 40 percent, about one-third higher than ever before.

Barley exports at the beginning of the decade stood at 6.1 million tons versus 7 million in 1969. The low-high levels were 4.9 million in 1963 and 7.8 million in 1965. Although barley still represented about 18 percent of world feedgrain trade in 1969, its share declined throughout most of the decade. The decline in U.S. barley exports alone accounted for nearly two-thirds of barley's decreased share of feedgrain exports during the sixties.

Oats was the only one of the four feedgrains that suffered an absolute decline in exports during most of the decade. From 1.5 million tons in world exports during 1960, they fell to 1 million in 1969. U.S. exports for the same years dropped from 600,000 to less than 100,000.

World feedgrain needs are rising

World population is currently expanding at the rate of about 2.6 percent per year for the developing countries and 1 percent per year for the developed countries. The bulk of world feedgrain trade takes place in the more developed countries, where increases in the standard of living are stimulating a rapid rise in the demand for the generally preferred high-protein foods such as beef, pork, poultry and eggs, and dairy products.

An increase in the consumption of any of these products normally causes a response in feedgrain requirements that is much greater than the increase for the product itself—mainly because more units of grain are necessary to provide a given number of calories when fed through animals than when consumed directly as human food. Also, direct human consumption of grain usually declines as consumption of high-protein foods increases. Most projections are for a continuation of these trends in many populous developed countries having limited facilities for increased feedgrain production. This is primarily what leads us to an optimistic outlook for feedgrain exports.

Opportunities for exporting countries

The United States, as one of the most efficient feedgrain producers and the largest exporter, can lead the way in meeting these greater needs. However, this goal will not be achieved easily. Many of the most likely markets have a strong urge to grow more of their own feed requirements, even at prices that may be double the world market level. The results are higher feed costs, higher end-product costs to the consumer, and—these products generally having elastic demands—a smaller increase in consumption.

High domestic prices for feedgrains in importing countries are usually coupled with various restrictive devices designed to prohibit or reduce importations of these grains from other countries. When high internal prices result in excess production—behind the protective barriers—the surplus is often subsidized into export channels. If such pricing and trade policies continue indiscriminately, the burden of adjustment might then be shifted to other producing countries, including those having the greatest comparative advantage.

Still another method employed by countries to meet large feedgrain needs is to encourage production of the needed import commodity in another country under some semi-controlled or guaranteed-type trade arrangement, which may include a direct or indirect obligation to import that country's products in return. Place these in the mix along with the development of regional trade groups, common markets, free trade areas, bilateral trade agreements, preferred transportation systems, and the like, and the difficult job of boosting U.S. exports can become a near impossibility.

Yet there are powerful incentives. At their 1966 peak, U.S. feedgrain exports were the equivalent of 15.7 million harvested acres of all feedgrains. For the individual commodities, exports in this record year were equal to about one out of every 3.2 bushels of off-farm marketings for corn; one out of every 2.2 for sorghum; one out of every 4 for barley; and one out of every 9 for oats. Moving these quantities of U.S. feedgrains is a job that has been done before, and done successfully. It requires trained, dedicated people, fulltime attention, agreement on specific objectives, the policy support necessary to achieve the objectives, coordination of efforts, successful promotion of the products, efficient delivery, and prompt, careful followup.

For U.S. feedgrains, the future holds problems—but problems give rise to opportunities, too. And the United States is in a strong position, both to tackle the problems and to take advantage of the opportunities.

Syria Dams the Euphrates—plans giant draught for cropland

By H. CHARLES TREAKLE
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Syria, like many of its sister countries in the Arab world, needs high agricultural productivity to provide food for its growing population, to supply much-needed exports to help balance its economy, and to be a source of income for its workers and farmers. But the country has not in the past, though traversed by a major river, had access to an abundant supply of one of the chief ingredients of successful agriculture—water.

Now an ambitious project is underway to control the flow of the Euphrates River (called the Al-Furat by the Arabs) to irrigate cropland, generate electric power, and mitigate floods. Work on a large dam—approximately 8,200 feet long and 197 feet high—was begun on March 6, 1968, at Tabaqa, a narrows in the Euphrates River.

When the first phase of the dam project is completed, scheduled for 1973, the dam will be built, electrical generators will have been installed with a capacity said to be 800,000 kilowatts, and 1,500,000 acres of farmland will have access to irrigation water from the dam reservoir. The electrical energy produced each year by the generators will be, according to the Syrian Government, about 1.55 billion kilowatt-hours. It will probably be used to power irrigation pumps, electrify towns, and run light industry. Storage capacity of the reservoir is planned to be 9 million acre-feet, or about one-third the size of Lake Mead, the reservoir behind Hoover Dam on the Colorado River.

A planned second phase of the dam project will bring an additional 900,000 acres under irrigation after the construction of the necessary barrages and canals. When the dam and new irrigation structures are completed (the target date is the late 1970's), 2,471,000 acres of Syrian soil will get irrigation water from the new reservoir. Since about 400,000 acres of this land is currently pump irrigated from the Euphrates, the total new irrigated land will be about 2,071,000 acres.

The Euphrates Dam, when it is finished, will be second in importance in the Arab world only to the High Aswan Dam in the United Arab Republic.

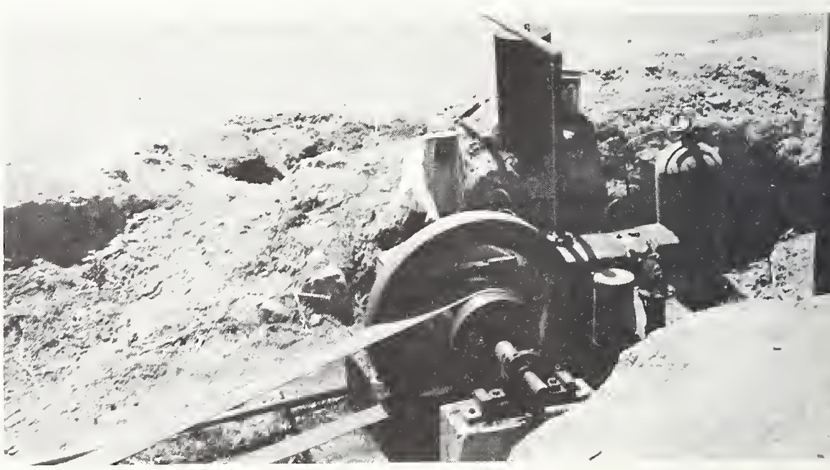
Syria is getting technical, financial, and material help from the Soviet Union on the Euphrates Dam project. The initial agreement between the USSR and Syria was signed on April 25, 1966. The protocol provided for a loan worth US$125 million for the first phase of the project at 2.5 percent annual interest. The loan is to be repaid in 12 annual installments beginning 1 year after completion of the first phase of dam and irrigation development. In addition, the Soviet Union is providing engineers and other needed technical personnel. Syria has also contracted with the USSR for all the necessary materials, machinery, and equipment not available locally for construction. At the time of the initial agreement between the Soviet Union and Syria, the total cost of the project was estimated at $628 million.

Near the end of June 1969 Syria announced that work on a coffer dam to divert water from the actual dam site was complete and that powerlines to Tabaqa from Aleppo were in place. It also said that excavations for the dam's power station were underway and that the usual spring flooding of the Euphrates had not seriously hampered work.

The river and its environment

The Euphrates River drains a basin in western Asia of over 100,000 square miles—about the size of the Rio Grande

Left, water is pumped from Khabur River to distribution tank in modern irrigation system. Below, small engines like this one are now used to power pumps that draw water directly from the Euphrates for local irrigation.



drainage basin in the United States and Mexico.

The Euphrates' headwaters are in some of the easternmost slopes of the Northern Anatolian or Pontic Mountains in eastern Turkey and the Bingol and Munzur Mountains in east-central Turkey. The Euphrates proper begins in eastern Turkey at the confluence of the Kara Su and Murat Rivers. About 40 percent of the Euphrates drainage basin is in Turkey and most of its flow originates in this area. In addition to runoff from late winter and spring storms, snowmelt from elevations up to 10,000 feet swells spring and early summer discharges.

About 15 percent of the Euphrates' drainage basin is in Syria. The river enters Syria near the town of Jerablus, about 60 miles northeast of Aleppo. First it flows south about 60 miles; then it turns and flows southeast to the Iraqi border. Its course is through a semiarid plateau for about 360 miles. Only two tributaries of importance add water to the Euphrates in Syria—the Balikh River in the north and the Khabur River flowing down from the northeast Syria to join the main stream about 60 miles from the Iraqi border. The Balikh and the Khabur contribute less than 10 percent of the Euphrates' flow. The only other water added to the main river in Syria is irregular runoff from small streams and wadis during spring storms.

The remaining 45 percent of the Euphrates' drainage basin is in Iraq.

The Euphrates, because most of its water is from spring storms and snowmelt, is a river with high variation in flow from season to season. The river is normally in flood stage sometime in May or June. After that it falls rapidly and by late summer its flow is only a small fraction of the spring discharge. River flow is also extremely variable from year to year because of the unpredictable precipitation both in the headwaters area and the Syrian plateau.

A third characteristic of the river is a decrease in its annual flow from upstream to downstream. Some of the water as it goes downstream is used for irrigation; some is lost by evaporation or the transpiration of plants; and some seeps through the river banks and bottom into surrounding land. All these processes are encouraged by the warm, dry climate. In Syria more water is taken out of the river or lost in its 360-mile trip than is added by the few tributaries.

The new dam on the Euphrates at Tabaqa is southeast of Aleppo, just about where the Euphrates' course turns from south to southeast. At this site the total annual flow is estimated at between 15 million and 20 million acre-feet. Flow during the year, except for unusually prolonged periods of drought or during floods, ranges from 70,000 to 170,000 cubic feet per second. This is between three to five times as great as the Euphrates' discharge near the Iraqi border. The dam site is an advantageous one for storing and distributing irrigation water and for the installation of a power plant.

Water and the Syrian farmer

Water has always been the key to agricultural abundance or disaster in Syria. At present only about 20 percent of the land seeded each year is irrigated; other cropland depends on rainfall for moisture. Precipitation in dryfarming areas ranges from 8 to 24 inches a year—but the average is only 16 inches or less. To add to farmers' troubles, rainfall is capricious, and periods of drought may be interspersed by cloudbursts and floods.

In years when rainfall is considered good, agriculture contributes about 25 percent of the Syrian gross national product; and farm products, especially cotton, account for over two-thirds of the value of Syrian exports.

But in a year of drought, such as 1966, production drops sharply. The 1966 wheat crop was almost 46 percent below the 1965 level, and barley output was down 70 percent. Usually Syria is a grain exporter; in 1966 it imported 350,000 metric tons of wheat. Overall exports were reduced more than 10 percent by value, and the negative gap in Syria's balance of payments widened. Cotton was not as seriously affected as grains because most of the cotton crop is irrigated. Fortunately, adequate rain fell the next crop year.

The fertile Euphrates valley has been irrigated to some extent from the beginning of history by striving farmers. The area now under irrigation is about 400,000 acres (one-fourth of the total irrigated land in Syria). The water is pumped directly from the river to irrigated fields. Not only is the

Above, irrigation waterwheels on Orontes River. Right, village birkit—all-purpose surface-water reservoir.

present system inadequate, but it is also vulnerable to damage or partial destruction when the Euphrates floods each spring.

When both the new dam and all subsidiary structures are completed, almost 2.5 million acres in the Euphrates valley will be irrigated. Accomplishment of this goal is planned in several steps.

The first development planned is a pilot project of up to 70,000 irrigated acres. As many as 50,000 people will be moved from the area to be submerged by reservoir water, resettled on the pilot project, and trained in irrigation techniques. Funds for this undertaking have been allocated in Syria's Second Five-Year Plan for Economic and Social Development (1966-70). Since the Second Plan terminates before the pilot project can be completed, other funds will probably be made available from a subsequent Plan. The Second Plan does not specify exactly how the newly irrigated land will be utilized.

The next step is the irrigation of about 1.5 million acres—to be accomplished by the end of the first phase of dam and irrigation development in 1973. The final step is the irrigation of additional new lands and the reorganization of already irrigated areas into the new irrigation system to bring the total irrigated land in the Euphrates valley up to about 2.5 million acres. It is thought that the land will be divided into relatively small farms of 12 to 25 acres each.

Irrigation and cotton

The expansion of irrigated acreage in the Euphrates valley will probably mean greater crops of cotton, vegetables, and pulses in Syria. Grain crops—wheat and barley—are chiefly grown in the northeast on rainfed and irrigated land that will not be benefited by the Euphrates reservoir.

Currently, 33 percent of the value of Syria's agricultural output comes from cotton—about 80 percent of which is grown on irrigated land. Some of the irrigation water comes from surface reservoirs, but the bulk is obtained by pumping water from rivers.

In 1968 Syria produced approximately 130,000 metric tons of cotton fiber for export from 544,000 acres of irrigated and 147,000 acres of unirrigated land. The total 1968 ginned cotton production was 153,631 metric tons.

Currently about one-third of Syria's 1.7 million acres of irrigated cropland is planted to cotton. Using this ratio, as newly irrigated lands become available over the next decade up to a third of the irrigated land will probably be planted in cotton. When the Euphrates irrigation complex is complete up to 690,000 acres of the newly irrigated land may be planted to cotton, and production of ginned cotton could increase by about 186,000 tons, assuming yields and other factors remain approximately what they currently are. Domestic use, which now takes about 25,000 metric tons, is expected to increase during the period and should it double by the time the project is complete, the cotton available for export would still increase to about 290,000 metric tons. Cotton has traditionally been Syria's chief cash export.

Specific goals for increased cotton production on the new Euphrates irrigated lands have not been stated by the Syrian Government. In the general objectives of the Second Plan (1966-70), aims for cotton production were a one-third increase. However, production in 1968, the midyear of the Second Plan, was about the same as the average for the previous 5 years. Preliminary reports of the 1969 crop indicate only an average cotton harvest—perhaps reduced by spring floods.

It may be that pressure on planners is to provide greater quantities of food and feed crops to provision a population gaining at an annual rate of about 2.8 percent. In the competition for newly available irrigated land, cotton, which had assigned to it a relatively small increase, is perhaps being elbowed out by crops with higher increase priorities. Crops for which the Second Plan slated particularly large increases were: green fodder, sugarbeets, yellow maize, citrus fruit, peanuts, broadbeans, apricots, apples, potatoes, olives, onions, grapes, tobacco, and irrigated wheat. Another factor working against expanded cotton acreage is the present low price of cotton on world markets.

New Institute To Spark Malaysian Farm Research

An institute that will intensify and coordinate agricultural research in Malaysia was inaugurated recently. The Malaysian Agricultural Research and Development Institute (MARDI) is an autonomous statutory research organization in the Ministry of Agriculture and Cooperatives.

Speaking at the inauguration ceremonies, Deputy Prime Minister Tun Razak pointed out that the establishment of MARDI was a step towards the scientific expansion and diversification of Malaysian agriculture. In addition to coordinating public and private research, the Institute is to help correct the imbalance of past agricultural development between export and food crops—to increase foreign exchange earnings and attain import substitutions.

The Deputy Prime Minister indicated that MARDI would have broad responsibilities for research throughout Malaysia in the production, utilization, and processing of all crops other than rubber, in livestock raising, and in inland fisheries. The Institute is also empowered to make grants to other established organizations for research.

Establishment of MARDI should help bridge the know-how gap in Malaysian agriculture. However, in spite of past handicaps arising from decentralized research, Malaysia has not done too badly; it is the world's top producer of natural rubber and palm oil and second largest producer of pineapple. Great strides also have been taken in the domestic production of rice, poultry, and hogs.

Prospective crops for expanded production are tapioca, corn, sorghum, and cacao. Increasing emphasis is being given to beef cattle production and off-shore and inland fishing.

Given appropriate leadership and time, Malaysia has the potentials to spark off a Green Revolution through centralized research programs. Coordinated research on various crops will not only make the most of scarce resources, but will speed the dissemination of research data. This is vitally important, because current food production in Malaysia is mainly a smallholders' enterprise, and—in order to enhance their production—smallholders need to learn how to apply scientific knowledge to specific problems. They also need better credit facilities for the purchase of farm inputs, a more favorable land tenure, and help in merchandising their products.

—Based on dispatch from DALE K. VINING
U.S. Agricultural Attaché, Kuala Lumpur

Comparison of U.S. and Foreign Cotton Ginning

By VERNON L. HARNESS
Cotton Division
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Exports of U.S. cotton have declined considerably over the past several years while most other major cotton-exporting nations have increased their shipments. Importers attribute the shift from U.S. cotton to other growths to the fact that much of the time comparable cotton is available from U.S. competitors at a lower price.

Although real progress has been made in consistently offering U.S. cotton in world markets at competitive prices, there is a growing awareness among cotton leaders that while the ability of producers to grow cotton efficiently is of the utmost importance it is only one of many requirements necessary to meet competition from other countries in world cotton markets. Efforts on the farm to produce cotton cheaply can be nullified by inefficiencies that occur between the farm and the customer.

U.S. ginning costs

Ginning costs in the United States are higher than in most foreign countries, costs varying from one State to another. Higher labor costs push up U.S. expenditures. Another factor is the custom of ginning each lot of seed cotton as soon as possible after arrival at the gin yard. This system requires far more plant capacity than is needed in foreign countries where seed cotton is often stored for several weeks or even months prior to ginning. The typical U.S. gin operates about ninety 8-hour shifts over a period of about 6 weeks while most foreign gins operate at least two or three times as many shifts spread over a period of several months.

Saw gins active in the United States in 1968-69 ginned about 2,600 bales each. However, output per gin varied widely from State to State and from one gin to another.

1968-69 U.S. SAW GINNING CHARGES AND OUTPUT

State	Gin installations	Production [1]	Average: Output per gin	Average: Estimated charge per bale [2]
	Number [3]	*1,000 bales* [4]	*Bales* [4]	*U.S. dollars*
Alabama	310	400	1,290	14.32
Arizona	122	724	5,934	20.08
Arkansas	444	1,034	2,329	18.49
California	266	1,580	5,940	21.44
Georgia	227	262	1,154	14.26
Louisiana	180	545	3,028	17.17
Mississippi	546	1,523	2,789	16.07
Missouri	114	196	1,719	20.73
New Mexico	58	165	2,845	19.41
North Carolina	143	125	874	17.77
Oklahoma	139	265	1,906	19.39
South Carolina	223	250	1,121	17.07
Tennessee	229	323	1,410	17.62
Texas	1,201	3,537	2,945	19.36
U.S. average	4,218	10,948	2,596	18.64

[1] Extra-long staple cotton is included in production but not in charges. [2] Includes bagging, ties, and seed cotton drying and cleaning. [3] Active. [4] 500 pounds gross weight. Source: Bureau of the Census.

Generally, older gins in the Southeast handled less cotton than newer establishments in the West, partly because of the westward movement of cotton acreage.

In an effort to gain insight into competitive aspects related to ginning, available information on charges and practices in several countries whose cotton competes with that of the United States in the world market has been compiled. The data were obtained from trade sources and from persons familiar with each nation's cotton industry. Gin numbers and output per gin should be considered as rough guides because output varies from one season to another as production and gin numbers change.

FOREIGN SAW GINNING CHARGES AND OUTPUT [1]

Country	Gin installations	Production	Average: Output per gin	Average: Estimated charge per bale [2]
	Number [3]	*1,000 bales* [4]	*Bales* [4]	*U.S. dollars*
Brazil:				
Southern	229	2,500	10,900	12.50
Northern	194	800	4,100	(5)
Colombia	60	650	10,800	7.43
El Salvador	13	205	15,800	14.00
Greece	67	404	6,000	7.00
Guatemala	27	335	12,400	12.50
Iran	250	519	2,100	7.50
Mexico	214	2,400	11,200	15.00
Nicaragua	34	405	11,900	(5)
Weighted average	—	—	—	12.24

[1] 1968-69 season, except 1966-67 season for Greece and Iran. [2] Includes bagging and ties. [3] Partly estimated. [4] 500 pounds gross weight. [5] Not available. Source: Official and trade statistics and other sources.

Ginning industries in most of the major competing countries are well equipped with modern plants in good repair. A substantial part of the bales are pressed to standard density and a few gins have high-density presses. Such preginning equipment as is needed for hand-picked cotton is generally used. However, some countries still have a considerable amount of outdated equipment.

Competitors' facilities

In southern Brazil production has been rising at a faster rate than installations have been enlarged. Ginning facilities have been able to handle the larger crops through extended operations, although the westward movement of production areas has necessitated removal of some facilities to newer regions and required other gins to serve rather distant producing areas. Production in northeastern Brazil has remained relatively constant. Gins are about equally divided between those which do good quality work and others whose quality is poor.

In Colombia, one-half of the present ginning capacity is comprised of four-stand high-speed units with standard density presses. Most other installations have two or three stands and flat presses. Colombia's production is expected to expand over the next few years and additional gin capacity is planned.

In Central America gin facilities are modern high-speed units which are in excellent condition. The gins were hard-pressed to handle the record crops in the mid-1960's, but production is now considerably smaller. Figures given for the volume handled by Central American mills are somewhat misleading because several double-battery units are counted as one gin.

In recent years Mexico has discontinued the use of one-third of the nation's gins. Most of the remaining installations are in good condition. Standard density presses predominate, although a few flat and high-density presses are also used.

A majority of the ginning facilities in Greece are fairly new. In Iran ginning facilities are available for handling a substantially larger crop although more covered storage for seed cotton is needed. A major part of the crop is ginned in modern plants owned by exporting firms. Although many other gins are equally modern, a considerable number are outmoded.

Gin varieties

A number of countries that compete with U.S. cotton use rollers gins or both roller and saw gins. In Pakistan about two-thirds of the 1968-69 crop of 2,450,000 bales was ginned by an estimated 215 saw gins. Each gin handles approximately 7,600 bales per season. The remainder of the crop is processed on roller gins. Estimates of the number of gins range from several hundred to 3,000 including small operations of one to four roller stands used to gin individual farm output. In the larger commercial installations gins are generally operated 19 to 24 hours a day for over 100 days and charges are about $5 per bale (in terms of 500 pounds gross). Most presses are of relatively high density.

Turkey used 34 saw gins and 642 roller gins to handle the 1968-69 crop of 2.0 million bales. Approximately one-fourth of the crop is saw ginned. Ginning charges range between $10 and $12 per bale and are about the same for either type of gin. Gins usually operate around 16 hours a day for 4 to 5 months. Low, standard, and high-density presses are used.

Uganda and Tanzania use roller gins exclusively. In Uganda, the nation's 52 gins handled an average of 6,700 bales each in 1968-69. All gins are now owned by cooperatives and most installations are capable of handling larger volumes over the 5- to 6- month ginning season. The estimated ginning cost of $16 per bale (500 pounds gross) includes a number of charges for services not normally associated with ginning.

Tanzania's 34 active gins handled an average of 6,900 bales each in 1968-69—considerably less than normal because of the unusually small crop. Most gins in the lake region are capable of handling 15,000 bales or more—during a normal 6-month season. Cooperatives operate most of the lake gins while coastal gins tend to have much less capacity and most are privately owned. Ginning fees are set by the Tanzanian Lint and Seed Marketing Board. A sliding scale has been established, whereby gins handling 5,000 to 5,999 bales receive $15.84 per bale (500 pounds gross) and gins handling 10,000 bales or over get $11.52.

This sample of estimated ginning costs in major competing countries clearly indicates the need for research to develop efficient methods in order to reduce U.S. ginning costs. Differences in ginning costs can appreciably change competitive relationships. For example, a $5 per bale difference in ginning costs is equal to about 1 cent per pound of lint—usually more than enough to cause the loss of a sale.

Brazil Expects Record Cotton Production and Exports

Brazil's 1969-70 (Aug.-July crop year) cotton crop is expected to reach 3.5 million bales (480 lb. net)—topping the 1968-69 record crop by 200,000 bales. This year's increase is the result of both expansion of area and higher yields per acre in southern Brazil which more than offsets the slight reduction anticipated in the Northeast.

Total area planted to cotton in southern Brazil is estimated at 3.5 million acres, compared with 3.1 million in 1968-69. Production in southern Brazil is forecast at 2.7 million bales of lint.

In southern Brazil, the São Paulo Department of Agriculture, the only source of cotton-planting seed for the State, has chalked up record sales this year. As of the first week in December unofficial reports placed sales at 1.6 million bags, 9 percent higher than the total for 1968. These sales figures confirm earlier reports of a large increase in cotton area in São Paulo. Trade sources report that cotton area in Paraná will be about 5 percent below the 1968-69 level, while plantings in other States of southern Brazil are expected to increase slightly.

Weather conditions in all major cotton areas of southern Brazil during the past 3 months have been very favorable. Seed germination appears good with little replanting necessary. However, there is some concern regarding reports of insect infestation in several areas.

The 1969-70 cotton crop for northeastern Brazil is now estimated at 800,000 bales, compared with 850,000 bales produced the previous year. This reduction is attributed mainly to unseasonal rains which fell in many cotton areas in August in the early part of the picking season.

Exports of cotton, Brazil's second most important export item, were at record high levels in 1969. Shipments from January through mid-November totaled 1.7 million bales valued at $174 million. It appears that 1969 exports may total nearly 2.0 million bales, compared with 1.1 million in 1968. Cotton exports in 1970 are expected to increase again, assuming production reaches indicated levels. At the present time it seems likely that there will be over 2.1 million bales of cotton available for export in 1970.

Most of southern Brazil's export shipments are made via the port of Santos. Normally Santos handles cotton movement smoothly, but from time to time there are delays due to port congestion.

Paraná's port, Paranaguá, is expected to handle increasing amounts of cotton in coming years. One factor which limits movement through Paranaguá is the lack of sufficient pressing equipment.

Brazilian cotton consumption continues at depressed levels with no indication of any substantial increase during the next year. Domestic utilization is expected to total about 1,325,000 bales in 1970. —Based on dispatch from SHACKFORD PITCHER
U.S. Agricultural Officer, São Paulo

The following article is the fifth in a series **Foreign Agriculture** *is running on principal items in the farm trade of Middle East and African nations important to American agriculture.*

Highlights of South Africa's Agricultural Trade

By MARY T. CHAMBLISS
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The value of the Republic of South Africa's exports continued to rise in 1968, reaching a high of $2.1 billion, excluding gold exports which are made to offset any deficit in trade of commodities and services. Import value fell slightly to $2.6 billion; however, this downward movement is unlikely to continue.

During the 1960's both the general economy and overseas trade of South Africa have been expanding. Total exports have consistently been on an upward trend. However, the availability of South African agricultural products for export fluctuates widely depending on the weather and growing conditions, both of which vary greatly from year to year. For example, in 1967 and 1968, agricultural exports soared because of the record corn crop of 1967; but in 1966, exports were low because of the small, drought-injured 1965 crop. In the same way, weather determines the amount and, to a limited extent, the kind of agricultural imports: because of the small 1969 corn crop, South Africa will probably be a net importer of corn during the 1969-70 marketing year (May-April), a very unusual situation.

South Africa is the United States largest commercial agricultural market in Africa. Major U.S. agricultural exports to the Republic are wheat, rice, and cotton. Prospects for wheat exports are not promising, however; South Africa is increasing its wheat production, hoping to become self-sufficient. Still, small imports of wheat for blending are likely to continue. And, any year South Africa's wheat crop is small, the United States can expect to make larger sales of wheat.

Prospects for U.S. agricultural exports of rice to South

SELECTED EXPORTS FROM SOUTH AFRICA

Commodity and country of destination	Average 1959-61	1966	1967	1968
	1,000 dol.	*1,000 dol.*	*1,000 dol.*	*1,000 dol.*
Wool	145,252	151,258	122,436	(1)
Japan	8,629	24,485	22,282	(1)
France	25,671	25,364	21,580	(1)
West Germany	19,682	20,849	18,505	(1)
United Kingdom	29,285	21,790	17,001	(1)
Italy	15,256	25,032	16,333	(1)
United States	21,595	20,725	15,519	(1)
Corn	36,101	3,510	110,532	146,408
Japan	12,932	21	51,341	67,065
United Kingdom	11,260	171	33,484	44,351
Italy	5,606	—	12,892	10,114
Sugar	22,628	45,358	45,398	54,095
Japan	—	9,325	14,381	22,803
Canada	—	11,666	12,343	16,740
United Kingdom	14,839	13,688	10,252	5,682
United States	—	9,301	7,285	7,053
Oranges	27,428	33,050	30,491	31,624
United Kingdom	13,334	12,577	12,663	13,343
France	2,484	7,135	5,844	6,310
West Germany	3,752	4,648	4,781	4,922
Netherlands	2,292	1,562	1,240	1,262
Apples	[2] 10,289	25,487	24,605	32,897
United Kingdom	6,528	16,966	14,531	16,360
Belgium	1,224	4,029	4,427	7,759
West Germany	—	1,951	2,320	3,850
Canned peaches	13,205	23,878	24,564	26,148
United Kingdom	12,673	19,357	18,811	17,345
West Germany	—	1,796	2,097	3,896
Canned pineapple	9,543	8,864	10,188	10,035
United Kingdom	5,465	4,947	4,928	4,097
West Germany	1,990	1,305	1,632	2,602
Canada	519	—	—	—
Grapes	8,336	12,972	14,534	13,140
United Kingdom	5,274	7,290	8,487	7,079
West Germany	898	1,656	1,927	1,927
Canada	—	933	1,186	883
Sweden	812	1,524	1,069	1,356
Other agricultural exports	153,518	147,423	183,052	(1)
Total agricultural exports	426,300	451,800	565,800	(1)
Total exports [3]	1,129,900	1,684,000	1,728,900	2,100,100

[1] Not available. [2] 1961 data only. [3] Excludes export of gold. Republic of South Africa, Foreign Trade Statistics, Vol. I, Imports and Exports, 1959-1967. 1968 trade runs from the Republic of South Africa.

SELECTED IMPORTS OF SOUTH AFRICA

Commodity and country of origin	Average 1959-61	1966	1967	1968
	1,000 dol.	*1,000 dol.*	*1,000 dol.*	*1,000 dol.*
Wheat	13,567	41,273	33,565	81
United States	1,509	25,863	6,103	50
Australia	3,998	7,451	13,733	—
Canada	8,060	6,615	13,726	—
Rice	5,663	11,656	13,351	15,479
United States	2,965	11,084	12,912	14,856
Thailand	1,509	—	—	—
Tea & mate	18,983	20,196	20,492	(1)
Ceylon	17,253	17,522	17,167	—
Cotton, raw	9,661	17,033	18,746	15,026
Brazil	1,220	7,658	7,529	6,079
United States	5,691	3,186	4,156	2,419
Argentina	—	—	521	—
Mexico	97	602	429	147
Turkey	256	257	279	—
Peru	412	—	—	107
Animal fats & oils	7,579	5,758	5,012	3,713
Australia	—	2,061	1,807	1,447
United States	4,692	1,384	920	1,174
United Kingdom	1,445	—	—	6
Essential oils	1,947	2,309	2,707	(1)
United Kingdom	448	878	840	(1)
United States	809	565	657	(1)
Netherlands	262	399	538	(1)
Other agricultural imports	57,200	113,775	84,927	(1)
Total agricultural imports	114,600	212,000	178,800	(1)
Total imports	1,406,600	2,303,800	2,682,400	2,622,700

[1] Not available. Republic of South Africa Foreign Trade Statistics, Vol. I, Imports and Exports 1959-1967. 1968 trade runs from the Republic of South Africa.

Africa are somewhat better than for wheat. South African rice imports are expected to continue their upward trend because consumption is increasing and there has been little production in the country. The U.S. share of this market will probably continue to increase because South African consumers have apparently developed a preference for U.S. rice.

Cotton is usually the third most important U.S. agricultural export to South Africa. However, in recent years South African purchases of U.S. cotton have tended to decline, while purchases of Brazilian cotton have increased. In addition, nearby African countries are increasing cotton exports to the Republic, and it is increasing its own production.

Some South African agricultural exports compete with U.S. products. Probably the area of greatest competition is in the feedgrain and fruit markets. Both the United States and South Africa are large exporters of grains to Japan, the United Kingdom, and the European Community. Because of the great variability of the weather in South Africa, however, the country is not a really consistent source of supply. Nevertheless, its production is trending upward. In recent good crop years, South Africa has been able to rapidly expand sales to Japan, as well as to its more traditional European markets; it is planning further expansion in the future.

South African canned fruit products are especially competitive with U.S. products. Exports of South African fruit, fresh and processed, are increasing; in addition, South Africa plans to expand fruit production for further export increases. Exports of canned peaches have almost doubled in the last 10 years and are expected to continue increasing. During the spring and summer, South African fresh citrus fruit is a primary competitor for U.S. citrus in the European markets. Also, South African fresh deciduous fruit exports, particularly of apples, overlap somewhat with U.S. deciduous fruit marketing in Europe.

Agricultural exports from South Africa to the United States are relatively small. The most important commodities involved are sugar—it participates in the U.S. sugar quota agreement—and wool. South Africa is also considering promoting its fruit products in U.S. and Canadian markets.

In general, however, agricultural trade between South Africa and the United States is limited because the two produce similar agricultural products. Nevertheless, trade in nonagricultural products will probably continue to grow.

Cattle Breeding in South Africa Keeps to Tradition

In South Africa today there are approximately 12 million cattle. Seventy percent of these are of Africander stock, a traditional breed derived largely from a native zebu cattle and developed largely as draft animals and animals that could walk a long way to market. Through recent years, the Africander hardiness, ability to withstand treks and disease, and to do reasonably well even under very adverse range conditions has endeared them to the Afrikaner people. Although the Africander cattle are still popular, complaints are arising because of the stress now on meat production: The cattle mature slowly, and until they reach an age older than the markets are now demanding they usually weigh 200-300 pounds less than other breeds of beef cattle.

As a result of this, attempts are being made to cross a number of breeds with the Africander cattle in order to get weight gains while at the same time maintaining the Africander hardiness and producing a uniform cattle with the desirable beef quality. Cross breeding on some breeds is new and data are still lacking on results.

Many of the European and American breeds although good in themselves and capable of transmitting hybrid vigor are not adapted to the dry desert conditions that prevail in much of South Africa. The most popular breeds for crossing with Africander are Brahman, Santa Gertrudis, Simmenthaler, Charolais, and Hereford.

Brahman have been crossed with Africander in a number of places with considerable differences in results. Some breeders claim that Brahman do not add anything to Africander, but others claim that they have received very satisfactory results. Brahman have also done well when crossed with cattle—European and indigenous—other than Africander or even bred straight. High production from crosses has been obtained. One complaint is that the Brahman crosses have no color uniformity.

Santa Gertrudis were brought to South Africa a number of years ago and did not do too well at Mara (Northern Transvaal). However, when the herd was shifted to Omatjenne in South West Africa it started to do exceptionally well. Many breeders are now interested in Santa Gertrudis, partly because of the results at Omatjenne.

Simmenthaler—straight or crossed with Africander—have done very well and often give high per day gains. One of the chief drawbacks of Simmenthaler is that they tend to continue growing and do not put on finish until they weigh more than is preferred on the market.

Charolais have done well straight or in Africander crosses as long as range and feed conditions are good. They are not, however, adapted to the drier areas.

Hereford crosses do not make the spectacular gains that some of the dual-purpose breeds make, but they do provide an acceptable quality of meat, are reasonably hardy, and improve growth considerably over straight Africander.

There have been no extensive trials including all breeds and crosses under the same conditions, but there have been a number of feeding trials where several breeds have been tested. At Omatjenne on 3-year tests, largest gains were registered by Simmenthaler cattle, but greatest returns were obtained by Santa Gertrudis—because of their higher grade and dressing percentage. In tests at Neudam, Simmenthaler again had greatest gains, but a cross of Africander, Hereford, and Charolais gave the best-quality carcass. No Santa Gertrudis were fed at Neudam.

In some feed tests in the Republic where 119 crossbred cattle were fed, highest gains were made by Brahman-Africander crosses. The Santa Gertrudis-Africander crosses were second, although because of their grade these crosses brought larger returns.

It appears that the Africander and its crosses will continue to be important in the beef industry of South Africa. A few other breeds, either in crosses or straight, should increase in importance; they include Santa Gertrudis, Brahman, Simmenthaler, and Hereford.

—Based on dispatch from William R. Hatch
U.S. Agricultural Attaché, Pretoria

Canada's New Hog Premium

The Canada Department of Agriculture (CDA) has announced that effective January 5, 1970, the Canadian Federal Government will pay a quality premium of C$1.50 on hog carcasses scoring an index of 105 or higher. The new premium level was set following consultation with producer representatives. Since March 31, 1969, a premium of C$3.00 has been paid on carcasses scoring 103 or higher.

CDA explained that the revised premium represents another step towards the day when hog quality premiums will no longer be paid. The hog quality premium was continued under the new hog valuation system, which came into effect December 30, 1968, as a double incentive to aid in the adjustment from one grading system to another. Under the new valuation system, carcasses scoring more than 100 are paid progressively more than the base price. In this way an incentive is automatically provided for producing carcasses with a higher proportion of lean meat, according to CDA.

CDA feels that continuance of the hog quality premium represents a double incentive to be applied only to high quality hog carcasses—that is, those indexing 105 and above. The need for a second incentive, according to CDA, diminishes as more producers adjust to the new valuation system. For this reason the hog quality premium is being gradually phased out. —Dispatch from Alfred R. Persi
Assistant U.S. Agricultural Attaché, Ottawa

Portugal To Import More Wheat

Small wheat and rye crops in Portugal in 1969 will undoubtedly lead to very large wheat imports in the 1969-70 marketing year. Now forecast by Portuguese grain trade officials is an average rate of imports of more than 30,000 metric tons per month plus occasional larger imports to replenish depleted stocks.

Corn imports are forecast to stay at a level similar to that of fiscal year 1968-69; however, the possibility of larger corn imports to balance the small oat and barley crops in 1968 remains.

In addition to the usual imports of malting barley in fiscal 1969-70, other imports of low-priced barley and grain sorghums for feed are a possibility. Imports of rice in fiscal 1969-70 probably will be reduced because of the large (estimated) 1969 domestic production.

No forecasts on 1970 winter small grain crops can be made yet, but weather conditions for sowing these crops have been favorable so far. —Based on dispatch from Ford M. Milam
U.S. Agricultural Attaché, Lisbon

IADB Loan for Colombian Roads

An Inter-American Bank loan equivalent to $17 million will help build 970 miles of feeder roads throughout Colombia, according to a recent Bank announcement. The roads will primarily benefit low-income farm families.

An agency of the Ministry of Public Works, the Fondo Nacional de Caminos Vecinales, will carry out the project. Total cost of the program is estimated at $36,650,000 of which the Bank's loan will provide 46.5 percent and local sources the remaining 53.5 percent.

Specifically, the construction works will include one 56-mile first-class road designed to carry a traffic load of more than 100 vehicles a day, 30 primary roads totaling 672 miles in length and designed for a volume of 50 to 100 vehicles daily, and 14 secondary roads totaling 240 miles and designed for less than 50 vehicles a day.

Colombia now has about 25,600 miles of national and departmental roads, of which relatively few are considered feeder or access roads. The scarcity of such roads has resulted in an inefficient flow of cash crops from farm to market and has led to higher transportation costs in areas without adequate market outlets. Recognizing the need to correct this deficiency, the Government of Colombia drew up a vast plan calling for a $172-million investment to build some 7,500 miles of such roads over the next 10 years. The program to be aided by the Bank represents the first stage of this plan.

Wheat in New South Wales Silos

Up to December 15, 1969, New South Wales silo systems had received 54,376,000 bushels of wheat, according to an announcement of the Grain Elevator Board. At the same time last year the receivals were 120,544,000 bushels.

The 1969 receivals were graded as follows: Fair Average Quality (FAQ), 25,756,000 bushels; offgrade, 25,228,000 bushels; prime hard, 2,909,000 bushels; and biscuit wheat, 483,000 bushels. Of the 1968 receivals, 90,045,000 bushels was graded FAQ, 6,625,000 bushels was offgrade, 23,421,000 bushels was prime hard, and 463,000 bushels was classed as biscuit wheat.

According to the Board Chairman, the quantity of offgrade wheat in 1969 was the highest in the Board's history and would probably reach 35 million to 40 million bushels of the total 155 million bushels forecast for New South Wales.

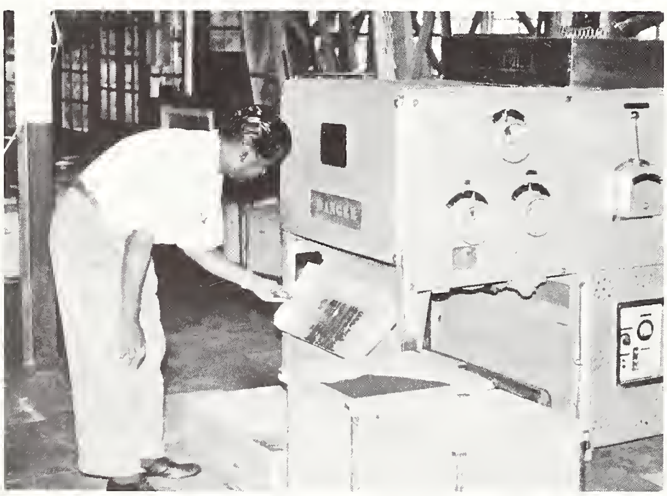
Principal reason given for so much offgrade wheat was frost damage in mid-September and development of black point and stem rust as a result of subsequent wet conditions in many areas. A considerable quantity of this offgrade wheat was included in the recent 90-million-bushel sale to China. —Based on dispatch from *Office of the U.S. Agricultural Attaché, Canberra*

U.K. Farmers Ask More Support

The president of the U.K. National Farmers' Union, G. T. Williams, has announced that the Union will press the government for a considerable increase in the level of farm support. He indicated that net farm income in 1970-71 must be at least $1,580 million and claimed that the estimated income of $1,222 million in 1968-69 (adjusted to normal weather conditions) was not proper remuneration for the country's 200,000 full-time farm businesses. He also added that the 1968-69 "normal" income was only about 5 percent above the level of the mid-1950's although production had increased by about 40 percent.

It is estimated that the Union's demands will mean an award of an extra $336 million in the value of guarantees in the United Kingdom's 1970 Annual Review and Determination of Guarantees. The previous record was $168 million in 1948, and the 1969 award was only $81.6 million.

Top of page, tea pickers on plantation in southern India. Above, worker in plantation tea factory pours dried tea into sifting machine to start the process of size separation. Below, teamaker inspects final grades from last sifting and sorting machine.



The Plantation Crops In India's Export Trade

By ROSS L. PACKARD
Office of Reports and Statistics
Foreign Agricultural Service [1]

Well over one-fifth (22 percent) of India's export trade volume each year consists of plantation crops—tea, coffee, rubber, cardamom, and pepper. Export earnings of these crops in 1967-68 amounted to $US350.5 million.

Tea the top item

Tea is by far India's most valuable plantation crop, and India grows about one-third of the world's supply. This makes India the world's leading tea supplier—a title it has held since the turn of the century—even though it has lost some of its export market in recent years and now ranks second to Ceylon as a tea exporter. The reason is that large quantities of tea are consumed within the country and this consumption has been increasing.

About one-half of India's tea production is exported each year, earning much-needed foreign exchange. In 1968 these exports earned the equivalent of $220.0 million, down from $250.0 million in 1967.

The United Kingdom is the big buyer of Indian teas. Ranking next—but considerably behind the United Kingdom—are the USSR, United Arab Republic, Canada, and the United States.

Tea exports to countries with which India has bilateral trade agreements have increased sharply in recent years; earnings from these exports cut into outright foreign exchange earnings.

Problem-fraught industry. The Indian tea industry has had a rough time in the past several years. Declines in the export duty on tea that were announced in 1969 have brought some relief but are being offset by increased production costs, part

[1] Formerly U.S. Agricultural Officer, Bombay.

On an Indian coffee plantation. Left, coffee picker at work; coffee plants grow in the shade of various cover trees. Above, coffee beans spread out to dry before being bagged; the berry, or pulp part, has been removed.

of which result from taxes on fertilizer. Many producers would like to see the export duty on tea abolished.

Other problems include taxes, lack of modernization, and loss of exports resulting from the higher prices that Indian tea producers must ask because of their higher costs of production. These high prices have led to the loss of a substantial part of the U.S. market.

Many tea plantations are past their economic optimum. Important in the long-term plans of these plantations will be the replantation subsidies provided by the government. These subsidies cover only about 40 percent of replantation costs; they are restricted to replanting in the strict sense but do not cover what is known as replacement or extension. The subsidy amounts to about $188.93 per acre for estates on the plains and $242.92 per acre for estates in the hills.

Production. Indian tea plantations—also known as tea gardens or tea estates—produced 401,800 tons of tea in 1968, 5 percent more than the previous record output in 1967. By 1975, production will be 466,000 tons if production targets are reached; this may be an overly optimistic goal, however.

India has over 3,000 tea gardens, most of them located in the two main tea-growing parts of the country—one in the northeast and the other in the south. The northeastern area—where three-fourths of India's tea is produced—centers around Darjeeling and Assam in or near the Himalayan foothills. The southern area is in and around the Nilgiris (Blue Mountains). Tea is generally grown at lower altitudes in Assam than in Darjeeling or southern India.

Harvesting tea is a job that requires careful judgment and a quickness of hands and eyes. Judgments must be made concerning the frequency of picking each bush and the stage of maturity of the first two leaves and the bud—the parts that are picked. In South India tea plucking continues throughout the year; in the north it is discontinued from mid-November to late March or April.

Processing tea. Once the proper leaves are picked the next important step in producing quality tea is to see that it is properly processed. To make sure of proper processing each tea estate generally has its own tea factory, with a master teamaker in charge. The orthodox method for processing black tea is described briefly in the next column.

The four principal operations in processing *black tea* are:

Tapped Indian rubber tree. Half a coconut shell hung under the diagonal cut catches latex, which is a thick white fluid.

withering, rolling, fermenting, and firing.

In withering, the water content of the leaf is reduced by half by forcing heated air through the leaves, which are spread on racks, for 12 to 18 hours. In rolling, the leaves are twisted and the leaf cells are broken, exposing the juices.

In the next processing stage—fermentation—the tannin in the tea is partly oxidized and the leaf changes to a bright copper red. The rolling and fermentation stages usually take 3 to 3½ hours.

The final stage—firing or drying—removes more moisture, leaving a moisture content of only 3 to 5 percent. In the first firing, only three-fourths of the moisture in the fermented leaves is removed; the second and final firing is carried out after the leaves are cooled somewhat.

The skill of the master teamaker in running the tea through these stages determines its quality.

Marketing. After processing, the tea is sorted, largely by size, into such categories as orange pekoe, pekoe, fannings, and dust. It is then packed in plywood tea chests lined with aluminum foil and paper.

Tea brokers, whose main function is to sell tea, keep the tea garden managers informed of changing market requirements and help them to improve on quality. For the tea

buyer, the broker secures information on crop prospects, quality, and availability of supplies. He also acts as principal and guarantees full payment to the sellers.

Tea produced in northern India is largely concentrated for sale and export in Calcutta. Most tea from southern India goes through the port of Cochin in Kerala.

Sales catalogs of the various teas are made up by the Calcutta and Cochin tea trade association; these catalogs give all quality and type details. The brokers receive the catalog along with samples, and their expert tasters test and value each lot. These appraisals are sent to the potential buyers. The buyers acquire the tea at auctions, basing their bids on details from their brokers plus samples. The first tea auction in India took place on December 27, 1861, in Calcutta. Tea purchased at auctions is rarely sold to consumers before it has been blended and packaged.

Coffee rates high in quality

India's coffee exports make up about 1 percent of total world trade in coffee and provide 1 to 2 percent of India's export earnings each year. In 1967-68 this amounted to some $24.2 million. About 40 percent of the crop is exported.

All Indian coffee is produced in the hills of southern India, a location well suited to coffee culture. The sunny slopes 2,500 feet to 4,500 feet above sea level, tropical sun, plentiful rains, rich, well-drained soil—all add up to a combination that produces high-quality coffee with a distinctive flavor.

Arabica and robusta are the two important coffee varieties grown in India. Both are cured by either the plantation or the cherry method. Plantation-cured coffee of the arabica varieties is generally considered to be the best.

Plantation curing—also called parchment processing—consists of depulping the berry by running it through a pulper—then fermenting, washing, and drying the pulp for 2 days. Cherry coffee is simpler to prepare; the berry is merely dried before it is husked.

Although a coffee bush can live almost half a century, producing one-half to one pound of coffee seed each year, such a performance has been the exception rather than the rule in India. Many plantations have been neglected and optimum production has never been reached.

It is estimated that the 1968-69 Indian coffee crop—harvested in the fall of 1969—was about 72,500 metric tons. Of this almost 50,000 tons was arabica, the rest robusta.

Rubber production pushed

Rubber production in India does not meet domestic demand; the policy in recent years has been to not export natural rubber. The difference between domestic supply and demand—some 20,000 to 25,000 metric tons a year—is supplied by imports of natural rubber and by production and imports of synthetic rubber.

Rubber is produced on over 300 large estates and some 90,000 small holdings in southern India. For 1968-69, production is estimated at 69,000 tons.

India's current development plan calls for bringing new areas under production at the rate of some 20,000 acres per year if suitable areas can be found. Smallholders are being encouraged with subsidies to replace their low-yielding rubber trees with trees of high-yielding strains.

The overall average rubber yield per acre is low now, but large plantations have fairly high yields. Some predictions are that production will reach 120,000 tons by 1973-74; realization of this goal will require considerable emphasis on additional inputs and new plantations.

Tapping of rubber trees takes place in the fall, the peak period being in November. At tapping time longitudinal stripes are cut diagonally on the trees. The latex drips into a container, often half a coconut shell, hung on the tree. Every few days the latex is collected and placed in drums. Rubber processing on the estates involves coagulation of the latex, pressing it to remove water, then smoking and drying it.

The plantation-processed rubber is further processed at about 1,100 rubber factories operating in India. Sixty-five percent of the rubber manufactured in India goes into tires and tubes, 10 percent is used in footwear, and the remaining 25 percent is used in the manufacture of a variety of items.

India's rubber industry has been plagued with labor unrest and problems of getting the crop harvested. Also, the whole matter of rubber imports has been a touchy one; planter associations generally feel that imports are unnecessary. Unless stability in growing areas can be guaranteed, it can be expected that the Indian rubber supply will continue to be short and imports of rubber or substitutes will be necssary.

Other plantation crops

Minor plantation crops include cardamom and cinchona. Also pepper—which is India's major spice export—is sometimes grown as a plantation crop. For information on India's pepper and cardamom exports, see *Foreign Agriculture,* November 24, 1969.

Cinchona, important as a source of medicine for antimalaria control, is grown in southern India.

Another plantation crop, cocoa, has still not come into the picture as a commercial crop in India. It was introduced into the country late in th 18th century, but the intensive dry season in India is not ideally suited to its production.

China Keeps Bulk Cargo Regulations

The Chinese Government has decided to continue bulk cargo import regulations in force since April 1969. The regulations have reduced harbor congestion and inland transportation blockage, according to the Bureau of Foreign Trade (BOFT), as well as balanced supply and demand.

The BOFT has accepted trade suggestions that commodity arrivals for 1970 be scheduled on a bimonthly basis and that the validity of import licenses be extended from 1 to 2 months. Barley has been added by the BOFT to the agricultural imports under the regulations. Other commodities regulated include wheat, corn, soybeans, cotton, luan logs, and several non-agricultural products.

The BOFT has been holding meetings with groups interested in soybeans, corn, and wheat. Reportedly, the BOFT has approved wheat imports to flour millers at a level of 350,000 metric tons for calendar year 1970, although the millers had requested at least 450,000 tons.

Flour millers had an allocation of 322,00 tons for the April-December 1969 period. Imports by flour millers would be in addition to government wheat imports through the Provincial Food Bureau, which had a 1969 quota of 148,000 tons. —Based on dispatch from Norman J. Pettipaw
U.S. Agricultural Attaché, Taipei

CROPS AND MARKETS SHORTS

U.S. Cotton Exports Low

U.S. raw cotton exports in November totaled 123,000 bales, down from 167,000 in October and 185,000 in November 1968. This is the smallest shipment for November since 1943. Exports during the first 4 months (August to November) of the current season were at a 14-year low of 579,000 running bales, down from 813,000 bales shipped during the same period a year earlier.

U.S. COTTON EXPORTS BY DESTINATION
[Running bales]

Destination	Year beginning August 1				
	Average 1960-64	1967	1968	Aug.-Nov. 1968	Aug.-Nov. 1969
	1,000 bales	*1,000 bales*	*1,000 bales*	*1,000 bales*	*1,000 bales*
Austria	23	1	9	0	0
Belgium-Luxembourg	121	45	30	9	6
Denmark	14	10	1	1	[1]
Finland	17	11	3	0	3
France	319	148	88	32	9
Germany, West	269	100	31	9	8
Italy	345	253	62	27	16
Netherlands	110	36	19	5	5
Norway	13	7	5	2	[1]
Poland	125	77	106	57	0
Portugal	21	9	8	3	2
Spain	74	7	5	3	1
Sweden	81	75	51	13	9
Switzerland	74	60	32	11	4
United Kingdom	244	125	48	14	6
Yugoslavia	112	67	54	0	0
Other Europe	17	24	7	1	0
Total Europe	1,979	1,055	550	187	69
Algeria	9	13	27	7	2
Australia	61	17	0	0	[1]
Bolivia	7	0	0	0	0
Canada	353	142	108	25	41
Chile	18	1	[1]	[1]	[1]
Colombia	3	0	[1]	0	0
Congo (Kinshasa)	6	13	0	0	0
Ethiopia	9	22	9	7	1
Ghana	1	12	17	7	2
Hong Kong	148	299	194	87	21
India	314	342	174	5	29
Indonesia	40	70	105	4	64
Israel	15	4	1	1	[1]
Jamaica	4	1	2	[1]	1
Japan	1,192	1,103	536	194	137
Korea, Republic of	261	351	447	145	110
Morocco	12	35	19	2	4
Pakistan	14	18	1	0	8
Philippines	123	154	119	42	24
South Africa	41	23	9	1	1
Taiwan	209	378	259	61	38
Thailand	34	90	66	23	6
Tunisia	2	14	0	0	0
Uruguay	6	0	0	0	0
Venezuela	8	[1]	[1]	[1]	[1]
Vietnam, South	46	24	62	6	19
Other countries	9	25	26	9	2
Total	4,924	4,206	2,731	813	579

[1] Less than 500 bales.

Exports to major U.S. raw cotton markets in Europe except Finland and the Netherlands during the first 4-month period were lower than exports for the same months in the previous year; and shipments to nearly all major markets in the Far East were down substantially. Exports to Canada, India, Indonesia, and South Vietnam, however, were larger than in the previous season.

Rotterdam Grain Price Report

Current prices for imported grain at Rotterdam, the Netherlands, compared with a week earlier and a year ago, are as follows:

Item	January 6	Change from previous week	A year ago
	Dol. per bu.	*Cents per bu.*	*Dol. per bu.*
Wheat:			
Canadian No. 2 Manitoba	1.95	0	2.03
USSR SKS-14	1.78	0	1.95
Australian Prime Hard			
U.S. No. 2 Dark Northern Spring:	[1]	[1]	[1]
14 percent	1.86	0	1.91
15 percent	1.92	0	1.97
U.S. No. 2 Hard Winter: 13.5 percent	1.73	−1	1.66
Argentine	1.73	+1	1.78
U.S. No. 2 Soft Red Winter	1.58	0	1.75
Feed grains:			
U.S. No. 3 Yellow corn	1.47	+1	1.39
Argentine Plate corn	1.46	−5	1.46
U.S. No. 2 sorghum	1.45	+1	1.35
Argentine-Granifero	1.38	−1	1.27
Spybeans:			
U.S. No. 2 Yellow	2.80	−2	3.03

[1] Not quoted.
Note: All quoted c.i.f. Rotterdam for 30- to 60-day delivery.

U.S. Tobacco Exports Up in November

U.S. exports of unmanufactured tobacco in November 1969 reached 74.7 million pounds (declared weight), compared with 71.3 million pounds during the same month a year ago. This was the highest for November since the record shipments of 1960. Export value—at $73.3 million—was also higher than the $68.2 million in November a year ago. Flue-cured, burley, and dark-fired tobacco were primarily responsible for the higher exports.

Though exports in recent months were up, cumulative totals for the year (January-November 1969)—at 499.9 million pounds—continued to lag about 7 percent behind 1968's 11-month period.

Lower exports for the 11-month period were recorded in all categories of tobacco with the exception of burley which showed a 13.3-percent increase. Total value of leaf exports, however, at $462.9 million, was 0.8 percent below 1968's January-November total of $466.6 million.

Exports of tobacco products in November were valued at $13.8 million, an increase of 11 percent over the same

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month of 1968. The cumulative value of tobacco products exported during the 11-month period, $141.7 million, was down 2.1 percent from the $144.8 million in the same period of 1968. Although shipments of cigars increased somewhat, losses were recorded for cigarettes, chewing tobacco, snuff, and smoking tobacco.

U.S. EXPORTS OF UNMANUFACTURED TOBACCO
[Export weight]

Kind	November 1968	November 1969	January-November 1968	January-November 1969	Change from 1968
	1,000 pounds	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*Percent*
Flue-cured	52,774	56,567	392,834	371,417	− 5.5
Burley	5,016	6,294	40,132	45,470	+13.3
Dark-fired Ky.-Tenn.	1,628	3,198	19,168	19,115	− 0.3
Va. fire-cured [1]	221	802	4,659	4,020	−13.7
Maryland	1,844	368	13,650	9,259	−32.2
Green River	1	—	503	440	−12.5
One Sucker	313	106	1,042	419	−59.8
Black Fat	170	110	2,365	880	−62.8
Cigar wrapper	315	114	4,329	2,140	−50.6
Cigar binder	35	277	2,126	849	−60.1
Cigar filler	18	94	589	551	− 6.5
Other	8,987	6,758	53,759	45,364	−15.6
Total	71,322	74,688	535,156	499,924	− 6.7
Declared value	*Mil. dol.* 68.2	*Mil. dol.* 73.3	*Mil. dol.* 466.6	*Mil. dol.* 462.9	*Percent* − 0.8

[1] Includes sun-cured. Bureau of the Census.

U.S. EXPORTS OF TOBACCO PRODUCTS

Kind	November 1968	November 1969	January-November 1968	January-November 1969	Change from 1968
Cigars and cheroots					*Percent*
1,000 pieces	5,412	6,157	62,200	62,533	+ 0.5
Cigarettes					
Million pieces	2,089	2,027	23,872	22,664	− 5.1
Chewing and snuff					
1,000 pounds	2	1	209	29	−86.1
Smoking tobacco in pkgs.					
1,000 pounds	83	68	1,346	978	−27.3
Smoking tobacco in bulk					
1,000 pounds	1,701	2,851	18,790	18,646	− 0.8
Total declared value					
Million dollars	12.6	13.8	144.8	141.7	− 2.1

Bureau of the Census.

New Cambodian Sugar Complex

On December 10, 1969, a new agro-industrial complex, (sugarcane cultivation and mill), was inaugurated at Kompong Kol in the Province of Battambang, Cambodia. With the exception of motors and some machine tools, all the equipment, including vats, has been manufactured locally. The idea of the complex was conceived in 1964, the first small planting of sugarcane was in 1966, and the first serious production began in 1968.

The new complex has involved the clearing of brush and jungle which will eventually amount to 6,000 hectares (14,826 acres); 1,500 will belong to the state and 4,500 will be divided among large and small planters. The total cost of the complex is estimated at $5.8 million, but the Government of Cambodia hopes to save some $1.6 million annually in the importation of sugar. The purposes of the complex include diversifying the agricultural economy, giving employment to more people, and saving on foreign exchange.

The present size of the complex consists of 600 hectares of cleared land with 200 planted. All 600 hectares are to be under cultivation by the end of May 1970. The sugar mill will have a daily capacity of 150 tons of cane resulting in the production of 10 tons of unrefined sugar. It is presently handling 33 tons of cane daily. However, in 1970-71, its daily capacity will be increased to 400 tons of cane. Most of the unrefined sugar is sent to the large sugar refinery at at Kampong Spen for final refining. To supplement its output of sugar, the complex is beginning the production of rum and cattle fodder.

Crops and Markets Index